WHAT IS CLAIMED IS:

1. A charged particle beam exposure system comprising:

a charged particle beam emitting device which generates charged particle beams with which a substrate is irradiated, said charged particle beam emitting device generating the charged particle beams at an accelerating voltage which is lower than that at which an influence of a proximity effect occurs, the proximity effect being a phenomenon in which a secondary charged particle and/or a reflected charged particle which is/are produced from the surface of the substrate irradiated with the charged particle beams influence(s) an exposure extent of a pattern which is adjacent to a pattern to be written;

an illumination optical system which adjusts a beam diameter of the charged particle beams so that density of the charged particle beams is uniform;

a character aperture in which an aperture hole is formed in a shape corresponding to a desired pattern to be written;

a first deflector which deflects the charged particle beams by an electrostatic field that the charged particle beams have a desired sectional shape and travel towards a desired aperture hole and which returns the charged particle beams passing through said aperture hole to an optical axis thereof;

a reducing projecting optical system which forms a multi-pole lens field so that the charged particle beams passing through said character aperture substantially reduce at the same demagnification both in X and Y directions when the optical axis extends in Z directions and form an image on the substrate without forming any crossover between said character aperture and the substrate; and

a second deflector which deflects the charged particle beams passing through said character aperture by means of an electrostatic field to scan the substrate with the charged particle beams.

2. A charged particle beam exposure system according to claim 1, wherein said reducing projecting optical system includes multi-pole lenses the number of which is N_1, N_1 being a natural

number of 3 or more.

3. A charged particle beam exposure system according to claim 2, wherein said second deflector deflects the charged particle beams in the X directions and the charged particle beams in said Y directions independently to each other.

4. A charged particle beam exposure system according to claim 3, wherein said N_1 is 4.

5. A charged particle beam exposure system according to claim 4, wherein said four multi-pole lenses are controlled to form first through fourth electrostatic fields so that said first through fourth electrostatic fields sequentially form a divergent electrostatic field, a divergent electrostatic field, a convergent electrostatic field and a divergent electrostatic field in one direction of the X and Y directions and so as to sequentially form a convergent electrostatic field, a convergent electrostatic field, a divergent electrostatic field and a convergent electrostatic field in the other direction of the X and Y directions.

6. A charged particle beam exposure system according to claim 5, wherein said second deflector includes a plurality of electrostatic deflectors.

7. A charged particle beam exposure system according to claim 6, wherein said second deflector superimposes an electrostatic deflection field on said multi-pole lens field to deflect the charged particle beams.

8. A charged particle beam exposure system according to claim 7, which further comprises a first main deflector which includes multi-pole electrodes, said first main deflector being provided between a second multi-pole lens and a third multi-pole lens of said first multi-pole lenses,

wherein said multi-pole lens is controlled to form first

through fourth electrostatic fields so that said first through fourth electrostatic fields sequentially form a divergent electrostatic field, a divergent electrostatic field, a convergent electrostatic field and a divergent electrostatic field in the X directions and to sequentially form a convergent electrostatic field, a convergent electrostatic field, a divergent electrostatic field and a convergent electrostatic field in the Y directions,

said third multi-pole lens and said fourth multi-pole lens serve as a second main deflector for superimposing an electrostatic deflection field on said multi-pole lens field, and

said second deflector includes said first main deflector and said second main deflector, said second deflector deflecting the charged particle beams independently in said X and Y directions by deflecting the charged particle beams in the X directions by a first main deflection field formed by said first main deflector and a second main deflection field formed by said second main deflector and deflecting the charged particle beams in the Y directions by said second main deflection field.

9. A charged particle beam exposure system according to claim 8, wherein said second deflector further includes a sub deflector downstream of said N_1-th multi-pole lens.

10. A charged particle beam exposure system according to claim 9, wherein said multi-pole lens is an electrostatic lens.

11. A charged particle beam exposure system according to claim 10, wherein said electrostatic lens is a quadrupole lens.

12. A charged particle beam exposure system according to claim 11, wherein said multi-pole lens has M ($M = 4N_2$, N_2 is a natural number of 2 or more) electrodes, adjacent N_2 electrodes thereof serving as a set of quadrupole lenses.

13. A charged particle beam exposure system according to claim 4, wherein the inside diameter of said first multi-pole lens and

said second multi-pole lens is a first inside diameter and the inside diameter of said third multi-pole lens and said fourth multi-pole lens is a second inside diameter which is greater than said first inside diameter.

14. A charged particle beam exposure system according to claim 13, which further comprises a first shielding electrode which is provided in the vicinity of the top and bottom faces of said multi-pole lens in the Z directions.

15. A charged particle beam exposure system according to claim 14, wherein the inside diameter of said first shielding electrode provided between the first multi-pole lens and the second multi-pole lens, of said first shielding electrodes, is a fourth inside diameter smaller than a third inside diameter which is the inside diameter of other first shielding electrode.

16. A charged particle beam exposure system according to claim 15, wherein said first shielding electrode with said fourth inside diameter serves as a first alignment aperture for the charged particle beams or a first detector for the charged particle beams.

17. A charged particle beam exposure system according to claim 16, which further comprises second shielding electrodes which are provided in the vicinity of the top and bottom faces of said first and second deflectors, respectively.

18. A charged particle beam exposure system according to claim 17, wherein the inside diameter of said second shielding electrode provided in the vicinity of the top face of said first main deflector, of said second shielding electrodes, is a fifth inside diameter which is smaller than said third inside diameter.

19. A charged particle beam exposure system according to claim 18, wherein said second shielding electrode with said fifth inside diameter serves as a second alignment aperture for the charged particle beams or a second detector for the charged particle beams.

20. A charged particle beam exposure system according to claim 19, wherein each of the lens lengths of said multi-pole lenses is about 6 mm, said first inside diameter being about 5 mm, said second inside diameter being about 10 mm, and the optical length between said character aperture and the substrate being 110 mm or less.

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